

Binarity among the Cepheids in the Magellanic Clouds

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ABSTRACT

Spectroscopic binarity of the Cepheid variable HV914 in the Large Magellanic Cloud is pointed out from the published radial velocity observational data. The list of known binaries among Cepheid type variable stars in the Magellanic Clouds is published in tabular form. The census indicates a serious deficiency of Cepheids with known companions as compared with their Galactic counterparts, whose implications are also discussed. A particular amplitude ratio ($A_{V_{\text{rad}}}/A_B$) of individual Magellanic Cepheids is studied in order to select promising candidates of spectroscopic binaries worthy of thorough radial velocity studies.

Key words: stars: variables: Cepheids – binaries: general – Magellanic Clouds

1 INTRODUCTION

Extragalactic Cepheid variable stars are key objects in astronomy because they are *standard candles* (primary distance indicators) owing to the correlation between their pulsation period, P , and luminosity, L – the well known P - L relationship.

The Magellanic Clouds have been pivotal objects in the permanent recalibration of the P - L relationship because the slope of this relationship is usually based on Cepheids in these two nearby extragalactic systems, while several carefully selected Galactic Cepheids serve as calibrators of the zero-point of the relationship.

When attempting to improve the calibration, one of the main goals is to decrease the spread of the points around the ridge-line fit. The dispersion of the relationship is caused by various factors (recently summarized by Szabados & Klagyivik 2012). One of these factors is the presence of a companion to the Cepheid.

The frequency of occurrence of binaries among Galactic Cepheids exceeds 50 per cent (Szabados 2003). There is, however, a strong observational selection effect that hinders the discovery of binarity, as pointed out by Szabados (2003). Owing to their distances, Cepheids in the Magellanic Clouds appear much fainter than their Galactic counterparts. One of the consequences of this fact is the extremely low number of Cepheids known to be members in binary systems in the Magellanic Clouds (see Sect. 3).

Binarity of Cepheids can be revealed by spectroscopic, photometric, or astrometric methods as summarized by Szabados & Klagyivik (2012). In the case of Cepheids in the

Magellanic Clouds, the spectroscopic method is the most efficient one in revealing binarity. The spectroscopic signs that hint at the presence of a companion include:

- a secondary star hotter than the Cepheid component results in an excess flux in the UV region as compared to the normal Cepheid spectrum;
- variations in the radial velocity due to the orbital motion superimposed on those of pulsational origin.

Cepheids in the Magellanic Clouds are too faint for UV spectroscopy with the current and former equipments (e.g., the *IUE* space mission dedicated for UV spectroscopy). Optical spectroscopy can be, however, instrumental in increasing the number of known spectroscopic binaries among Magellanic Cepheids. The orbital effect can be observed if the line of sight towards the Cepheid is nearly parallel or subtends a small angle to the orbital plane of the spectroscopic binary system.

In this paper we point out spectroscopic binary nature of HV914 in the Large Magellanic Cloud (LMC) (Sect. 2). Based on a comprehensive search for relevant data and papers in the literature, we publish a state-of-the-art census of known binaries among Magellanic Cepheids (Sect. 3) and select several suspected binaries suggested for dedicated spectroscopic studies (Sect. 4).

2 HV914

The brightness variability of this Cepheid located in the LMC was discovered by Leavitt (1908) based on Harvard photographic plates. The Cepheid nature of variability and the first value of the pulsation period (6.8795 d) was published by Payne-Gaposchkin (1971). Further observations

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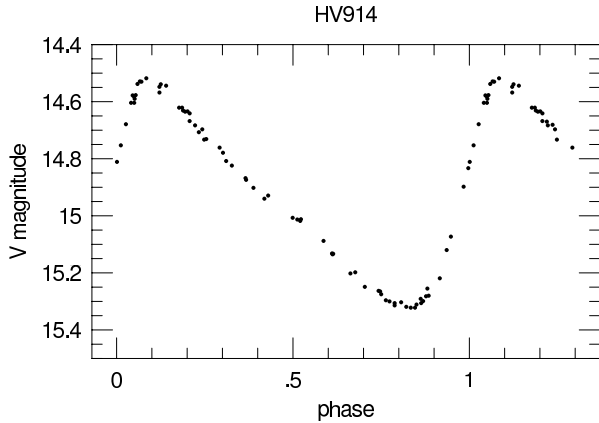


Figure 1. OGLE-III photometric V phase curve of HV914 (Soszyński et al. 2008a). The data have been folded on the period rounded to 6.8784 d, the zero phase set arbitrarily at JD 2 400 000

of this Cepheid have not been performed until the commencement of the microlensing projects. The analysis of the extensive OGLE-III photometric data set (obtained in V and I bands) resulted in an accurate period of 6.8783932 d (Soszyński et al. 2008a). The phase curve in V band is plotted in Fig. 1.

Recently, HV914 was included in a spectroscopic observational project of Magellanic Cepheids (Storm et al. 2011). The impressive radial velocity phase curves published by Storm et al. (2011) densely cover the whole pulsation cycle for all target Cepheids and the individual data scatter around the normal curve by less than 0.1 km s^{-1} for the 22 program stars except HV914 (see Fig. 2 in Storm et al. 2011).

In the case of classical Cepheids, such excessive dispersion of the radial velocity phase curve can be caused by:

- using an inaccurate period when plotting the phase curve;
- an additional excited mode;
- spectroscopic binarity.

The value of the pulsation period is accurately known from the precise OGLE-III photometric data covering the years 1997–2008. Because the radial velocity data by Storm et al. (2011) are based on observations performed during the years 2000–2003, the same period can be assumed as obtained from the OGLE-III data: 6.8783932 d. In fact, Storm et al. (2011) plotted their radial velocity data for HV914 using the period of 6.878425 d which is not identical with the previous value but this slight difference (of 0.000032 d) cannot be responsible for the dispersion exceeding 5 km s^{-1} seen in the radial velocity phase curve.

The high-quality light curve (Fig. 1) testifies that HV914 is a single-mode Cepheid. An indirect additional evidence in favour of the single-mode pulsation is the fact, that secondary periods are only excited in Cepheids with fundamental period shorter than 4 days in the LMC (Soszyński et al. 2010a).

If HV914 has a physical companion orbiting the Cepheid component, the orbital period cannot be shorter than 1–2 years, because Cepheids are supergiant stars. In this case a seasonal shift is expected in the radial velocity phase curve whose amount depends on the orientation of the orbital plane with respect to the line of sight. In fact,

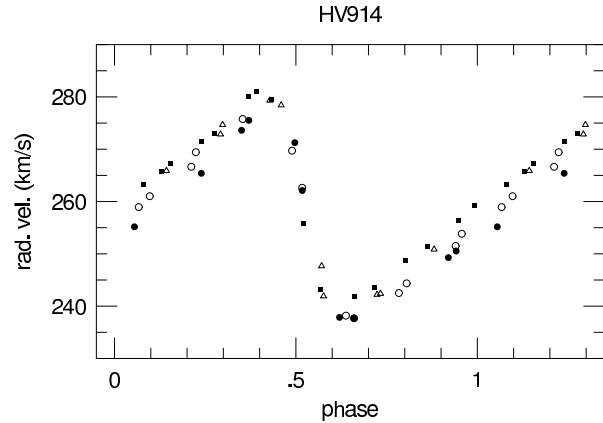


Figure 2. Radial velocity phase curve of HV914 based on the data published by Storm et al. (2011). Data representing the 1999/2000 observing season are marked with filled squares; 2000/2001 data: open triangles; 2001/2002 data: open circles; 2002/2003 data: filled circles

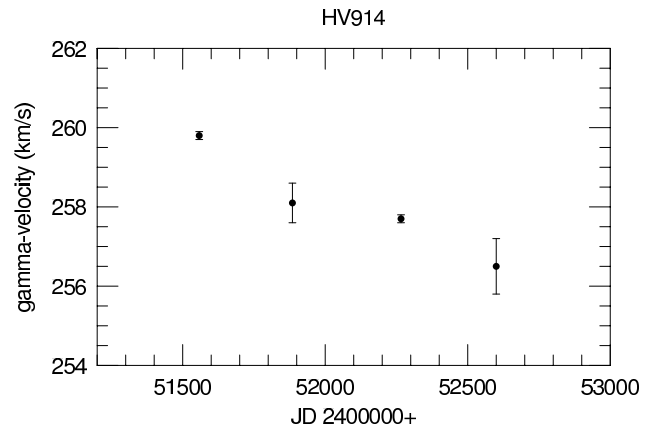


Figure 3. Temporal drift in the γ -velocity of HV914

such seasonal shifts are noticeable in Fig. 2. The thousand-day observational interval was not sufficiently long to cover a complete orbital cycle. But even in this case, the monotonic shift of the centre-of-mass radial velocity (γ -velocity) plotted in Fig. 3 refers to the orbital motion, i.e., to spectroscopic binarity of HV914.

3 KNOWN BINARIES AMONG THE MAGELLANIC CEPHEIDS

There are 3361 known classical Cepheids in the LMC (Soszyński et al. 2008a) and 4630 classical Cepheids are known in the SMC (Soszyński et al. 2010a). Tables 1–2 list all non-solitary Cepheids (i.e., classical and Type II Cepheids, as well) known in the LMC and SMC, respectively. In view of the high incidence of binaries among Galactic classical Cepheids, there is a serious deficiency of known binaries among Magellanic Cepheids.

In the LMC, four Cepheids are members in spectroscopic binaries, 11 Cepheids show eclipsing variability superimposed on the pulsational variations. Furthermore, there are 3 double Cepheids which probably form physi-

Table 1. Known binaries among Cepheids in the Large Magellanic Cloud

Cepheid	P_{puls} (day)	Remarks Type (orbital period) [cross-ID]	Reference
HV883	133.9	SB	Imbert (1994)
HV914	6.8784	SB [OGLE-SMC-CEP-1249]	present paper
HV12202	3.10112	SB	Welch et al. (1991), Storm et al. (2005)
HV12204	3.43876	SB	Welch et al. (1991), Storm et al. (2005)
OGLE-LMC-CEP-0227	3.79709	EB (309.673 d)	Pietrzyński et al. (2010)
OGLE-LMC-CEP-1812	1.31290	EB (552.0 d)	Soszyński et al. (2008a)
OGLE-LMC-CEP-2532	2.03536	EB (800.5 d) [MACHO 81.8997.87]	Soszyński et al. (2008a), Alcock et al. (2002)
OGLE-LMC-CEP-1718	1.96366+2.48094	Double Cepheid + EB (825.6 d)	Soszyński et al. (2008a)
OGLE-LMC-T2CEP-021	9.7596	EB (174.83 d)	Soszyński et al. (2008b)
OGLE-LMC-T2CEP-023	5.2348	EB (88.51 d)	Soszyński et al. (2008b)
OGLE-LMC-T2CEP-052	4.66795	EB (123.81 d)	Soszyński et al. (2008b)
OGLE-LMC-T2CEP-077	1.213802	EB (34.621 d)	Soszyński et al. (2008b)
OGLE-LMC-T2CEP-084	1.770840	EB (52.355 d)	Soszyński et al. (2008b)
OGLE-LMC-T2CEP-093	17.5930	EB (419.9 d) [MACHO 78.6338.24]	Soszyński et al. (2008b), Alcock et al. (2002)
OGLE-LMC-T2CEP-098	4.97374	EB (397.2 d) [MACHO 6.6454.5]	Soszyński et al. (2008b), Alcock et al. (2002)
MACHO*04:59:17.5 -69:14:18	2.1010+3.0805	Double Cepheid	Alcock et al. (1995)
MACHO*05:04:02.3 -68:21:32	2.7509+4.5630	Double Cepheid	Alcock et al. (1995)

Table 2. Known binaries among Cepheids in the Small Magellanic Cloud

Cepheid	P_{puls} (day)	Remarks Type (orbital period) [cross-ID]	Reference
HV837	42.6789	SB	Imbert (1994)
HV11157	69.0	SB	Imbert (1994)
OGLE-SMC-CEP-0411	1.10098	EB (43.498 d)	Soszyński et al. (2010a)
OGLE-SMC-CEP-1526	1.29023 + 1.80431	Double Cepheid [SMC_SC5_208044]	Soszyński et al. (2010a)
OGLE-SMC-CEP-1996	2.31795	EB (95.594 d)	Soszyński et al. (2010a)
OGLE-SMC-CEP-2699	2.11748 + 2.56230	Double Cepheid	Soszyński et al. (2010a)
OGLE-SMC-CEP-2893	1.13586 + 1.32155	Double Cepheid	Soszyński et al. (2010a)
OGLE-SMC-CEP-3115	1.15979 + 1.25194	Double Cepheid	Soszyński et al. (2010a)
OGLE-SMC-CEP-3674	1.82776 + 2.89605	Double Cepheid	Soszyński et al. (2010a)
OGLE-SMC-T2CEP-007	30.9606	ELL (392.93)	Soszyński et al. (2010b)
OGLE-SMC-T2CEP-010	17.4807	ELL (198.18 d)	Soszyński et al. (2010b)
OGLE-SMC-T2CEP-023	17.6753	EB (156.884 d)	Soszyński et al. (2010b)
OGLE-SMC-T2CEP-025	14.17089	ELL (174.87)	Soszyński et al. (2010b)
OGLE-SMC-T2CEP-028	15.2643	EB (141.835 d)	Soszyński et al. (2010b)
OGLE-SMC-T2CEP-029	33.6765	EB (608.6 d)	Soszyński et al. (2010b)

cal pairs consisting of two Cepheid components. Such pairs are similar to the Galactic binary Cepheid CEa Cas + CEb Cas. This archetype of Cepheid pairs is described by Opal et al. (1988). Interestingly, one of the double Cepheids in the LMC shows eclipsing light variations, as well, i.e., this system consists of three components. Triple systems frequently occur among Galactic classical Cepheids, see the on-line data base of binary Cepheids: <http://www.konkoly.hu/CEP/intro.html>.

As to the SMC, there are 4 known spectroscopic binaries and 5 eclipsing binaries involving a Cepheid component, as well as 5 double Cepheids. In addition, 3 Cepheids show variability typical of ellipsoidal binaries superimposed on the pulsational variations.

The frequency of known binaries among Magellanic Cepheids is at least two orders of magnitudes lower than the corresponding frequency of binaries among Galactic classical Cepheids. This must be an observational selection effect. Therefore, discovery of a plethora of new binary systems

among Magellanic Cepheids is expected from a suitable observational material.

4 SELECTION OF MORE CANDIDATE BINARIES

To facilitate the selection of promising binary candidates among Magellanic Cepheids, we applied the amplitude ratio criterion (see Klagyivik & Szabados 2009). This method is based on the fact that a companion star decreases the observable photometric amplitude while the amplitude of radial velocity variations ($A_{V_{\text{rad}}}$) remains unaffected, or an unrevealed orbital motion superimposed on the V_{rad} variations of pulsational origin even increases the observable peak-to-peak amplitude. A thorough study of more than 200 Galactic Cepheids (Klagyivik & Szabados 2009) has shown that the average value of the amplitude ratio $A_{V_{\text{rad}}}/A_B$ (where A_B is the peak-to-peak photometric amplitude in the John-

Table 3. Amplitude ratios for Cepheids in the Large Magellanic Cloud

Cepheid	Period (d)	A_B (m)	A_V (m)	$A_{V_{\text{rad}}}$ (km/s)	q	A_V/A_B	q'	Mode	Sources
HV873	34.46	-	1.328	49.58	-	-	24.64	F	6, 10, 13
HV867	22.72	-	1.179	61.34	-	-	34.34	F	10, 13
HV877	45.29	0.999	0.607	30.47	30.50	0.608	33.13	F	6, 7, 13
HV878	23.30	1.969	1.187	60.34	30.64	0.603	33.55	F	6, 10, 13
HV879	36.82	1.896	1.197	54.29	28.63	0.631	29.93	F	4, 7, 8
HV881	35.74	1.677	1.285	50.96	30.39	0.766	26.17	F	6, 10, 13
HV883	132.26	1.671	-	62.86	37.62	-	-	F	2, 3, 5, 7, 8, 10
HV899	31.32	1.963	1.221	58.91	30.01	0.622	31.84	F	4, 6, 7, 8
HV900	48.02	-	0.940	46.58	-	-	32.71	F	5, 6, 7, 8, 13
HV909	37.54	1.702	-	44.21	25.98	-	-	F	4, 6, 7, 8
HV914	6.88	-	1.006	43.52	-	-	28.55	F	13
HV1005	18.72	1.796	1.111	62.44	34.77	0.619	37.09	F	7, 10, 13
HV1006	14.22	-	1.241	54.35	-	-	28.90	F	10, 13
HV1023	26.56	1.508	1.017	52.04	34.51	0.674	33.77	F	7, 13
HV2257	39.37	1.873	1.179	50.79	27.12	0.629	28.43	F	4, 6, 7, 8, 10
HV2282	14.68	-	1.040	53.42	-	-	33.90	F	10, 13
HV2338	42.20	1.916	-	51.17	26.71	-	-	F	4, 6, 7, 8
HV2369	48.36	1.830	1.233	47.10	25.74	0.674	25.21	F	2, 6, 7, 13
HV2405	6.29	-	0.478	25.25	-	-	34.86	F	13
HV2447	118.20	0.913	-	27.74	30.38	-	-	F	2, 5, 6, 7, 8
HV2527	12.95	1.585	1.030	53.45	33.72	0.560	34.25	F	7, 10, 13
HV2538	13.87	-	0.544	32.01	-	-	38.84	F	13
HV2549	16.22	1.546	1.135	40.76	26.36	0.734	23.70	F	7, 10, 13
HV2694	6.94	-	0.937	42.81	-	-	30.15	F	11
HV2827	78.78	0.910	-	26.57	29.20	-	-	F	4, 7, 8
HV2883	108.93	1.974	-	49.07	24.86	-	-	F	2, 5, 6, 7, 8
HV5497	99.45	0.838	-	25.58	30.53	-	-	F	2, 5, 6, 7, 8
HV5655	14.21	-	0.956	54.37	-	-	37.54	F	7, 13
HV6093	4.78	-	0.834	41.24	-	-	32.64	F	13
HV12197	3.14	0.835	-	35.13	42.07	-	-	1OT	9, 12, 14, 15
HV12198	3.52	0.927	-	42.59	44.87	-	-	1OT	5, 11, 12, 14, 15
HV12199	2.64	1.021	-	44.92	44.00	-	-	1OT	12, 14, 15
HV12202	3.10	0.682	-	53.80	78.89	-	-	1OT	12, 14, 15
HV12203	2.95	0.950	-	38.91	40.96	-	-	1OT	12, 14, 15
HV12204	3.44	1.002	-	52.88	52.77	-	-	1OT	12, 14, 15
HV12452	8.75	-	0.852	37.91	-	-	29.37	F	13
HV12505	14.39	-	0.911	52.31	-	-	37.90	F	10, 13
HV12717	8.84	-	0.823	37.47	-	-	30.05	F	10, 13
HV12815	26.12	1.813	-	59.85	33.01	-	-	F	1, 7, 8, 10
HV12816	9.10	1.041	-	29.15	28.00	-	-	F	1, 7, 8
NGC1866-V4	3.34	0.405	-	17.46	43.11	-	-	F	12, 15
NGC1866-We8	3.04	0.879	-	34.90	44.23	-	-	F	15
U1	22.54	1.853	1.116	67.29	36.31	0.602	39.80	F	10, 13

1 - Caldwell et al. (1986); 2 - Freedman et al. (1985); 3 - Imbert (1994); 4 - Imbert et al. (1985); 5 - Imbert et al. (1989); 6 - Madore (1975); 7 - Martin & Warren (1979); 8 - Moffett et al. (1998); 9 - Molinaro et al. (2012); 10 - Sebo et al. (2002); 11 - Storm et al. (2004); 12 - Storm et al. (2005); 13 - Storm et al. (2011); 14 - Walker (1987); 15 - Welch et al. (1991)

son B band), denoted by q is 32.79 for fundamental mode Cepheids without known companions and 35.23 for first overtone Cepheids, also without companions. Significantly larger q values may hint at the presence of companion(s).

To determine the q value of Magellanic Cepheids, we collected the B and V photometric data and the spectroscopic radial velocity observational data published in the literature or accessible from public online data bases. We redetermined the pulsation period using the program package MUFAN (Kolláth 1991). The peak-to-peak amplitudes were determined from the phase curve folded with this period and the Fourier fit taking into account the shape of the phase curve (at certain period values the Hertzsprung pro-

gression of Cepheids results in rather sharp features in the phase curves that may affect the amplitude). The results are summarized in Tables 3 and 4 for the Cepheids in the LMC and SMC, respectively. The individual columns of both tables contain the following data:

1. - Identification of the Cepheid;
2. - Pulsation period (in days) rounded to two decimals;
3. - Peak-to-peak amplitude in the Johnson B band, A_B ;
4. - Peak-to-peak amplitude in the Johnson V band, A_V ;
5. - Peak-to-peak radial velocity amplitude, $A_{V_{\text{rad}}}$;
6. - The q amplitude ratio;
7. - The ratio of amplitudes in V and B bands, A_V/A_B ;
8. - The q' amplitude ratio explained in the text;

Table 4. Amplitude ratios for Cepheids in the Small Magellanic Cloud

Cepheid	Period (d)	A_B (m)	A_V (m)	$A_{V_{\text{rad}}}$ (km/s)	q	A_V/A_B	q'	Mode	Sources
HV821	128.0	0.972	-	32.18	33.11	-	-	F	1, 3, 5, 6, 7, 8
HV822	16.7	-	1.172	57.87	-	-	32.58	F	6, 9
HV824	65.9	1.431	-	43.08	30.10	-	-	F	1, 5, 7, 8
HV829	85.3	1.043	-	34.02	32.62	-	-	F	1, 3, 5, 6, 7, 8
HV834	73.6	1.357	-	51.41	37.89	-	-	F	1, 3, 5, 6, 7, 8
HV837	42.7	1.434	0.885	47.87	33.82	0.617	35.70	F	1, 5, 6, 7, 8
HV1328	15.8	1.072	0.772	24.29	22.66	0.720	20.77	F	9
HV1333	16.3	-	0.931	50.35	-	-	35.69	F	1, 9
HV1335	14.4	1.264	0.814	38.14	30.17	0.644	30.92	F	1, 9
HV1338	8.5	1.293	0.888	37.87	29.29	0.687	28.15	F	1, 2, 8
HV1345	13.5	1.184	0.795	36.10	30.49	0.671	29.97	F	9
HV1365	12.4	1.049	0.835	41.85	39.90	0.796	33.08	F	1, 2, 7, 8
HV11157	69.2	0.653	0.382	24.09	36.89	0.585	41.62	F	1, 3, 4, 5, 6, 7, 8

1 - Caldwell & Coulson (1984); 2 - Caldwell et al. (1986); 3 - Freedman et al. (1985); 4 - Imbert (1994); 5 - Imbert et al. (1989); 6 - Madore (1975); 7 - Martin & Warren (1979); 8 - Moffett et al. (1998); 9 - Storm et al. (2004)

9. - Pulsation mode (F for fundamental mode, 1OT for first overtone pulsation);
10. - Sources of the observational data listed as footnotes to the respective tables.

This q -method involves the B photometric amplitude because the overwhelming majority of Cepheid companions are blue stars thus the diminution of the amplitude in B is more prominent than in the V band. B -band photometry for Magellanic Cepheids is often unavailable because extragalactic Cepheids are much fainter than their Galactic counterparts. Extensive photometry in V band is, however, available in the OGLE-III data base (<http://ogledb.astrouw.edu.pl/~ogle/CVS/>). The V amplitudes in Tables 3 and 4 are listed based on the analysis of these data without mentioning this source in the last column.

The known photometric amplitude in the V band allowed us to compute a ‘pseudo- q ’ value based on the fact that there exists a close correlation between the V and B photometric amplitudes of Cepheids: the ratio of $A_V/A_B = 0.685 \pm 0.004$ for Galactic Cepheids without known companions (Klagyivik & Szabados 2009). The corresponding amplitude ratio is $A_V/A_B = 0.66 \pm 0.01$ for the Magellanic Cepheids involving both Clouds from the data listed in Tables 3 and 4. Here binary Cepheids have not been excluded causing a slight increase in the actual value of the ratio that, however, can be neglected for our purpose. The missing A_B value was then replaced by $A_V/0.66$ in calculating the q parameter. The value derived in such a way is denoted as q' , and this was referred to as the ‘pseudo- q ’ value.

Again, an excessive value of q' can be a sign of a companion. Those Cepheids which have both q and q' values show reliability of the q parameter, and the large value of either q or q' parameter testifies usefulness of this binarity indicator. The known spectroscopic binaries HV883, HV12202, HV12204 in the LMC, as well as HV11157 in the SMC all have much larger q and/or q' values than the corresponding average for Cepheids of the given pulsation mode. Moreover, HV837 is an example for a Cepheid in a spectroscopic binary that has an almost normal q value.

There are other Cepheids showing excessive q and/or q'

values: HV1005, HV2538, HV5655, HV12505, NGC1866-V4, NGC1866-We8, and U1 in the LMC, as well as HV1365 and HV834 in the SMC. All of them are fundamental mode pulsators. A dedicated radial velocity study of these Cepheids can lead to the discovery of their spectroscopic binary nature.

Some radial velocity data are available for each of these candidate binaries.

- For HV2538, HV5655, and HV12505 the data were collected during a time interval as short as two weeks in 2005 (Storm et al. 2011), thus a second epoch radial velocity series can help reveal a variable γ -velocity.
- The 7 v_{rad} values published for NGC1866-V4 cover only a week (Welch et al. 1991).
- There are 53 radial velocity data on HV834 obtained between 1981 and 1985 (Imbert et al. 1989) but the phase curve does not indicate any variability in the γ -velocity.

For the other four candidates, there are some pieces of evidence of binarity based on the available radial velocity data.

- HV1005 was observed by Storm et al. (2011) mostly in 2005, and the additional three points obtained in 2007 significantly deviate from the phase curve plotted for the 2005 data.
- Data for U1 were also obtained by Storm et al. (2011) in three different observing seasons. Unfortunately, different parts of the phase curve were covered in each season, so there is no apparent dispersion of the data points but the shape of the phase curve is untypical of the given pulsation period. However, the strange shape of the phase curve can be reconciled by some vertical shift of the data obtained in different years, i.e., by “adjusting” the γ -velocity.
- The available radial velocity data on HV1365 were obtained in three observing seasons (Caldwell et al. 1986). An annual shift in the γ -velocity is suspected that has to be confirmed by new and more accurate radial velocity data.
- The clearest (though still weak) spectroscopic evidence of binarity exists for NGC1866-We8, whose radial velocity phase plot (based on 6 data) contains a deviating point (from 1989) with respect to the 5 observational data obtained in 1988 (see Fig. 30 in Welch et al. 1991).

Revealing binarity of individual Cepheids in the Magellanic Clouds is important because the calibration of the P - L relationship relies on the slope determined from Magellanic Cepheids. Companions to Cepheids increase the dispersion of the resulting P - L relationship. Moreover, shorter period Cepheids are more affected by the adverse photometric effects because of smaller luminosity difference between the Cepheid and its companion. This may even cause a period dependent slope of the P - L relationship.

To avoid such distortions, Cepheids with known companions have to be excluded from the calibration of the P - L relationship. If, however, physical properties of the companions can be determined, the P - L relationship can be calibrated based on the binary Cepheids themselves (see e.g., Evans 1992).

5 CONCLUSION

Spectroscopic binarity of HV914, a Cepheid in the Large Magellanic Cloud has been revealed from existing radial velocity data. Further accurate data are necessary to determine the orbital elements.

The census of Cepheids known to belong to binary systems is also studied for both Magellanic Clouds. The serious deficiency of binary member Cepheids (with respect to their Galactic counterparts) is explained by the lack of dedicated observational studies. Radial velocity observations of a large number of Cepheids in the Magellanic Clouds, especially those having high values of the q and/or q' amplitude ratios (listed in this paper) are desirable.

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